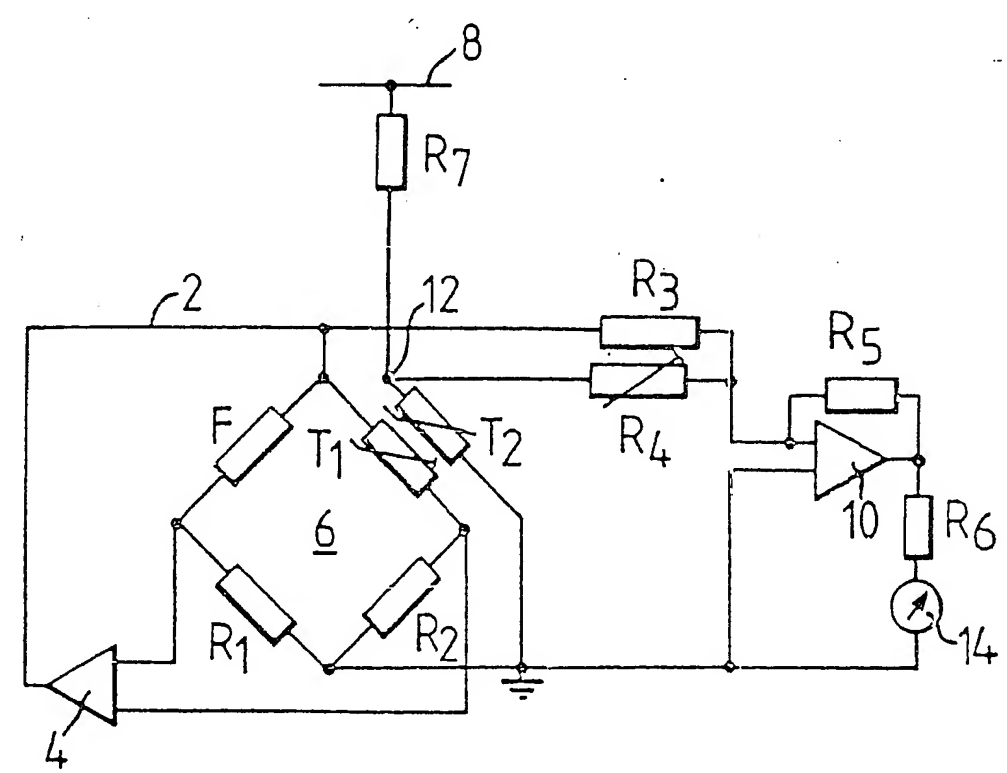
(12) UK Patent Application (19) GB (11) 2 105 047 A

(21) Application No 8224544
(22) Date of filing 26 Aug 1982
(30) Priority data
(31) 8126395
(32) 28 Aug 1981
(33) United Kingdom (GB)
(43) Application published 16 Mar 1983
(51) INT CL³ G01L 21/12
(52) Domestic classification G1N 1A3B 1A3C1 1D13 1F 3S1A 3S2 7C AHB
(56) Documents cited
GB A 2043915
GB A 2034482
GB 1523391
GB 1480500
GB 1431039
GB 1317845
(58) Field of search G1N
(71) Applicant
BOC Limited
(Great Britain)
Hammersmith House
London W6 9DX
(72) Inventor
Alan Edward Holme
(74) Agents
Dr George Renton
BOC Limited
PO Box 39
Great West Road
Brentford
Middlesex
TW8 9DQ

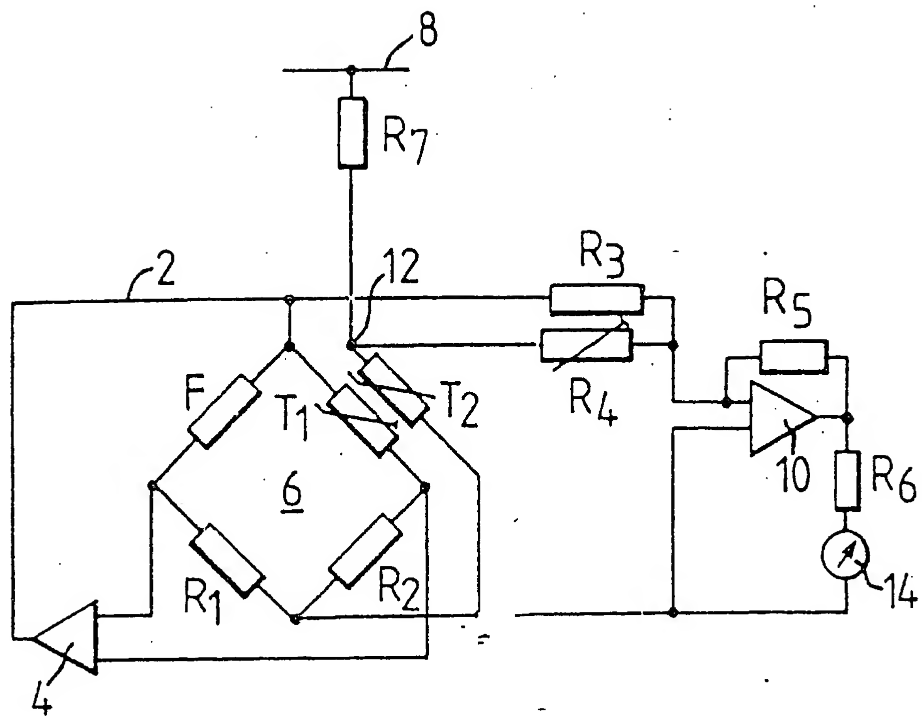
(54) Pirani gauges

(57) In a circuit for controlling the temperature of a filament F in a Pirani gauge head, secondary temperature compensation is provided by mounting an auxilliary resistor T2 adjacent the temperature-compensating arm T1 of the bridge circuit 6. The resistor T2 forms part of a potential divider which provides a preset offset voltage to an associated output amplifier 10. This offset voltage is added algebraically to the variable voltage driving the bridge circuit 6 so as to provide additional temperature compensation. The measured value is thus accurate over the whole of the operating range instead of at just one point.



GB 2 105 047 A

AN


8
R7
2
12
R3
R5
F
T1
T2
R4
10
6
R6
R1
R2
14
4

SPECIFICATION

Gas pressure measuring circuit

The present invention relates to a measuring circuit for a Pirani gauge. Such gauges are used for measuring the pressure of a gas by means of a heated filament of which the temperature is measured in terms of its electrical resistance. The temperature of the filament, or the rate at which it loses heat to its surroundings, is a function of the gas pressure, and hence either of these factors may be used to permit the gauge to measure vacuum.

In a Pirani gauge, the filament is in one arm of a Wheatstone bridge circuit. The gauge may be operated in either a constant temperature or a constant voltage mode. In the former mode, the rate at which energy is supplied to keep the filament at a constant temperature is varied with changes in gas pressure, and hence this rate of change acts as a measure of the degree of vaccum. In the latter mode, the variation with gas pressure in the electrical imbalance of the bridge acts as a measure of the degree of vaccum.

The measuring circuit of the present invention is designed to operate in the constant temperature mode.

In known Pirani gauges, some degree of temperature compensation is provided by putting a temperature-dependent resistor in another arm of the bridge. The resistance variations with temperature which this produces apply throughout the whole of the normal temperature range of operation of the gauge, which is usually 10 to 50°C, but complete compensation can be effected only at one temperature, which is arranged to be at one end of the scale.

The present invention according to its broadest aspect, provides a circuit for operating a Pirani gauge comprising an electrical bridge which has one arm adapted to receive the gauge and which is arranged to produce an output signal representative of gas pressure within the gauge, electrical means not embodied within an arm of the bridge and effective to produce a signal indicative of the ambient temperature in which the gauge operates together with signal translation means responsive to the output of the bridge and of the electrical means and capable of producing a gas pressure signal compensated for ambient temperature changes.

Conveniently the electrical means comprises a resistive element which preferably forms part of an electrical network such as a potential divider across which a substantially constant potential difference is applied. The potential appearing at a tap of the divider suitably is, together with the signal from the bridge, applied to the input of an amplifier whose output can be used to provide an indication of temperature compensated gas pressure.

In a preferred embodiment of the invention a degree of temperature compensation additionally is provided by a resistive element embodied in one arm of the bridge.

An embodiment of the invention will now be described by way of example with reference to the accompanying drawing which is schematic diagram of a circuit for a pirani gauge.

Referring to the drawing, the resistor F is the Pirani gauge filament which is to be heated by current drawn from a variable voltage rail 2 drawing its power from the output of an amplifier 4. The balancing arm of the bridge 6 includes a primary temperature-compensating resistor T1. The other two ratio arms of the bridge 6 are provided by resistors R1 and R2.

Situated adjacent to resistor T1 is a resistor T2 providing the improved temperature compensation. It is adjacent to resistor T1 in order to be subjected to the same temperature changes as that resistor. Resistor T2 is connected to a constant voltage rail 8 through a resistor R7. Because the other side of resistor T2 is connected to earth, resistors R7 and T2 form a potential divider, the mid-point of which is coupled through a preset resistor R4 to the input of a second amplifier 10 which is bridged by resistor R5. The variable voltage rail 2 is connected through resistor R3 to same input of the amplifier. In this way, the variations in the voltage of point 12 caused by fluctuations in the resistance of resistor T2, lead to a voltage being added algebraically to that at the outlet of resistor R3, so as to produce the desired offset in the effective voltage of rail 2. This offset voltage is amplified by amplifier 10 and fed through a resistor R6 to a meter 14 which is calibrated in terms of gas pressure.

By virtue of the connection of the respective diagonal of bridge 6 across the inlets of amplifier 4, the signal in rail 2 varies as a function of the value of the resistance of filament F, with the voltage applied across the signal diagonal of bridge 6 being designed to keep this resistance, and therefore the temperature of filament F, constant.

The primary compensating resistor T1 can be preset, as illustrated, so that it exactly compensates for other variations at one point in the operating temperature range of the associated Pirani gauge. As the temperature of the secondary resistor T2,varies in operation of the gauge, the offset voltage fed resistor R4 has its amplitude controlled by presetting R4 at a chosen temperature. It has been found that the characteristics of resistors T1 and T2 complement each other to a large extent so that the resultant circuit indicates the measured gas pressure more accurately over the normal range of operating temperature.

CLAIMS

1. A circuit for operating a Pirani gauge comprising an electrical bridge which has one arm adapted to receive the gauge and which is arranged to produce an output signal representative of gas pressure within the gauge, electrical means not embodied within an arm of the bridge and effective to produce a signal indicative of the ambient temperature in which the gauge operates together with signal translation means responsive to the output of the bridge and of the electrical means and capable of producing a gas pressure signal compensated for ambient temperature changes.

2. A circuit as claimed in claim 1 wherein the Pirani gauge is arranged to operate in a constant filament temperature mode.

3. A circuit as claimed in claim 1 or claim 2 wherein the electrical means comprise a temperature-sensitive, resistive device.

4. A circuit as claimed in claim 3 wherein the resistive device forms part of a network and is effective to produce from a potential difference applied across the network a signal responsive to temperature change.

5. A circuit as claimed in claim 4 wherein the resistive device forms part of a potential divider.

6. A circuit as claimed in claim 5 wherein the signal from a tap of the divider and the bridge output signal are applied to the input of an amplifier whose output can be used to provide representatives of temperature-compensated gas pressure.

7. A circuit as claimed in preceeding claim wherein a resistive device is provided in an arm of the bridge to provide temperature compensation.

8. A circuit as claimed in claim 7 wherein both resistive elements are proximate.

9. A circuit for operating a Pirani gauge substantially as herein described with reference to the accompanying drawing.

10. A Pirani gauge operating circuit substantially as shown in and adapted to operate substantially as herein described with reference to the accompanying drawing.

Printed for Her Majesty's Stationery Office
by Burgess & Son (Abingdon) Ltd.—1983.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.